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Art. VIII.—*The Devonian and Older Palaeozoic Rocks of the Tabberabbera District, North Gippsland, Victoria.*

By

PROFESSOR ERNEST W. SKEATS, D.Sc., A.R.C.S., F.G.S.
(University of Melbourne).

(With Plate XV.)

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Introduction.

The geology of the Tabberabbera district has long been recognised as presenting interesting problems concerning the Middle Devonian sediments, because their lithological characters, as well as the subsequent earth movements which have affected them, present a contrast with the rocks of the better-known areas of Buchan and of Bindi in Eastern Victoria. As no geological work had been done in the region under discussion for over a quarter of a century, I welcomed the opportunities which arose in January, 1924, and January, 1925, of paying visits to the area. Through the kindness of Mr. W. Baragwanath, Director of the Geological Survey of Victoria, camping facilities were made available. Mr. Baragwanath joined me for the first four or five days of field work, Mr. J. Easton, Geological Surveyor, and his assistant (Mr. Norman Winter) were with me throughout the three weeks spent in the field, and Mr. Keble, of the Geological Survey, was with us for the last five days of the first trip, and Mr. Easton was with me during three weeks of the second visit. While I am responsible for the form and substance of this communication, I owe much to help rendered in the field by the gentlemen above mentioned.

Previous Literature.

The late Dr. A. W. Howitt, whose pioneering geological work in Gippsland was so remarkable, was the first to investigate the area about 50 years ago (1). His report is not only a valuable contribution to the geology of a wide area, but includes an exceedingly interesting account of a trip in bark canoes downstream from Tabberabbera through the gorge of the Mitchell River, accompanied by two aboriginals, Turnmile, meaning "one who swaggers," and Bungil Bottle, distinguished for his capacity for the absorption of strong waters.

The peculiar nature and compressed character of the mid-Devonian Tabberabbera shales was recognised and described and their unconformable relations to the flat-lying beds of the Upper Devonian Iguana Creek series was recognised and figured.

Mr. E. J. Dunn (2) in 1890 published the account of a rapid survey of the area. His account refers to the presence of Silurian [Ordovician] rocks in Sandy's Creek, and of small areas of limestones in the Tabberabbera series. A sketch map accompanying Mr. Dunn's report shows the approximate distribution of the Silurian [Ordovician], Middle Devonian and Upper Devonian sediments.

Mr. O. A. L. Whitelaw (3) in 1899 published some sections illustrating the relations of rocks from the district, in a general account of Devonian rocks in Gippsland.

Mr. H. Herman (4), in June, 1899, published a short account of the Tabberabbera district with sketch geological map and section.

Mr. R. Etheridge (5), in 1899, gave identifications and descriptions of Silurian corals from Sandy's Creek.

Mr. T. S. Hall (6 and 7), described Upper Ordovician graptolites from Sandy's Creek.

Location of area and means of access.

The district described in this paper constitutes a roughly rectangular area of approximately 30 square miles. It lies within the Counties of Dargo and Wonnangatta, and includes parts of the parishes of Tyirra, Nungatta, Cobbannah and Morekana. The parish plans, on a scale of 2 inches to the mile, contain little topographical detail, and parts of them, in this sparsely settled region, are blank. The name of Tabberabbera does not occur on them, but is understood to refer to the scattered settlements close to the junction of the Mitchell and Wentworth Rivers. This lies about 40 miles WNW. of Bairnsdale, which is about 170 miles east of Melbourne. Tabberabbera, I understand, is an aboriginal name meaning Thunder, and in the months of January and February, during the occasional storms, the noise of thunderclaps reverberating among the hills of the district makes the naming appropriate.

The conditions of access to the district have much changed in the last forty years. Then it was difficult to reach the area, as there was no good graded road from Bairnsdale, but within the area access to various parts was readily made by good mining tracks, which were kept in repair, as alluvial and reef gold mining were then fairly active. Good grazing existed, as rabbits had not then invaded the district, so that, apart from the miners, there was a fair number of settlers running cattle, which assisted to keep the tracks open. Now there is a good graded and metalled road from Bairnsdale to Bullumwaal, and a good graded and formed road from Bullumwaal to Tabberabbera. But within the district mining has long ceased, mining tracks are overgrown, rabbits have come in, and therefore the country carries only a fraction of the cattle formerly grazed. Settlement has, in consequence, declined, blackberries have over-run many of the gullies, and hop vine and other secondary scrub all contribute to make the district one in which it is not easy to do geological mapping. The district is rough and hilly, in places with steep, precipitous gorges, and in the months of January and February, apt to be uncomfortably hot. In the circumstances, much of the energy one would like to put into geological mapping is necessarily expended in the physical exertion of climbing, or of forcing one's way through scrub.

Nature of work done.

The total period of six weeks spent in the field allowed of some attention being paid to the stratigraphical and tectonic problems of the area, but, having regard to the fairly rugged topography, was insufficient for detailed mapping. The geological map which accompanies this paper, while it represents a considerable advance of knowledge over the earlier pioneer work, must be regarded as a sketch map. In particular, the boundaries shown for the Upper Devonian rocks are only roughly approximate, as this series was not the main object of study. The boundaries shown between Middle Devonian and Silurian rocks and between Silurian and Upper Ordovician rocks are based on more careful work, checked by palaeontological determinations kindly made for me by Mr. Chapman, Palaeontologist to the National Museum. Even these junctions, away from the sections exposed in the rivers, are only sketched in. It is clear, therefore, that until a detailed survey is made, some of the problems of stratigraphy and of tectonics cannot be completely solved, and such conclusions as are drawn in this paper are necessarily qualified by this consideration.

The sketch geological sections accompanying the map, and drawn nearly to the same vertical as horizontal scale, represent an attempt to illustrate the structure of the area.

Physical Features of the Area.

On approaching the area from Bullumwaal by road over the Upper Ordovician rocks, the following aneroid heights were noted:—Bullumwaal 735′, Burnett-Merrijig divide 1475′, Merrijig River crossing 1005′, Merrijig-Sandy's Creek divide 1475′, road crossing over upper part of Sandy's Creek 695′, Sandy's-Wentworth divide (at the Gooseneck) 1105′, Camp No. 1 460′, Wentworth R. level near Camp No. 1 450′. The rough timbered country of the Upper Ordovician series in the eastern part of the area rises, therefore, to a maximum of 1000 feet above the level of the Wentworth River.

The Silurian rocks occupying the northern central part of the area yield fairly open undulating country in the valleys, especially near the junctions of the Wentworth and Mitchell Rivers, and the

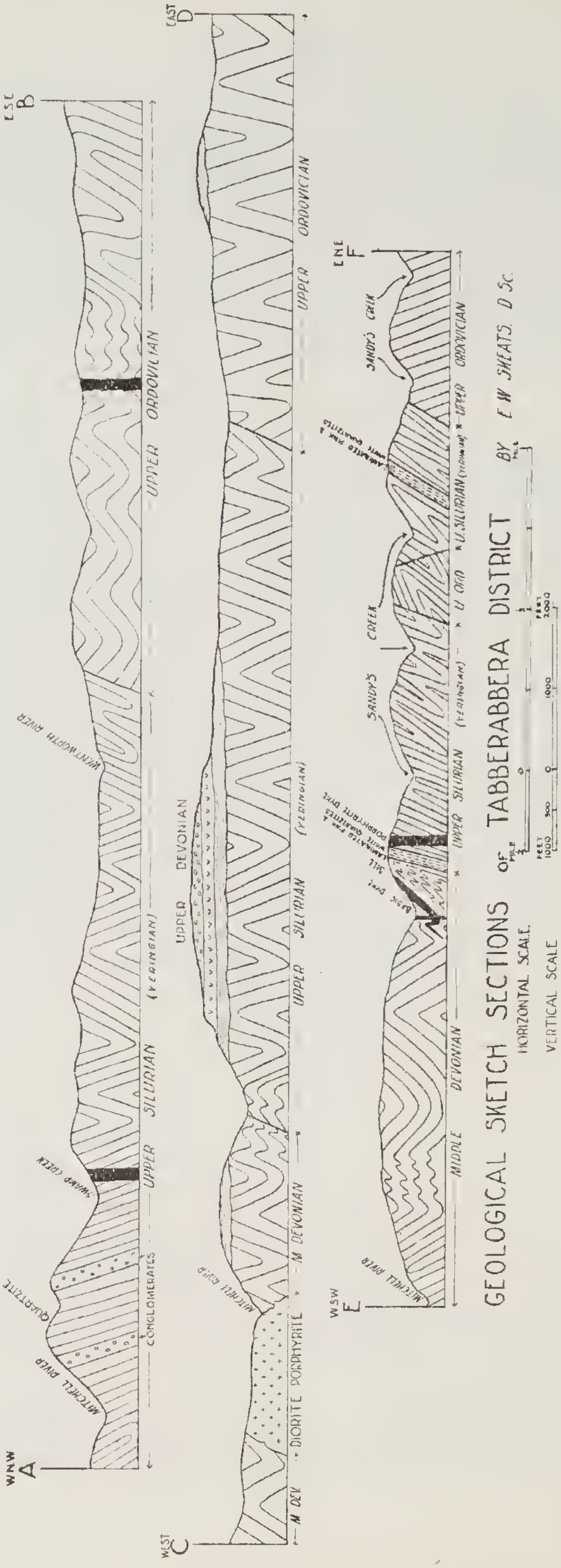
WNW A
ESE B
MITCHELL RIVER
QUARTZITE
SWAMP CREEK
WENTWORTH RIVER
CONGLOMERATES
UPPER SILURIAN (YERINGIAN)
UPPER ORDOVICIAN
WEST C
EAST D
M DEV
DIORITE PORPHYRITE
M DEVONIAN
UPPER DEVONIAN
UPPER SILURIAN (YERINGIAN)
UPPER ORDOVICIAN
WSW E
ENE F
MIDDLE DEVONIAN
BASIC DYKE
SILL
SANDY'S CREEK
U ORD
U. SILURIAN (YERINGIAN)
UPPER ORDOVICIAN
GEOLOGICAL SKETCH SECTIONS OF TABBERABBERA DISTRICT BY E W SKEATS D Sc
HORIZONTAL SCALE
VERTICAL SCALE

Fig. 1.

mouth of Swamp Creek. In following up Swamp Creek to the north a prominent sandstone hill to the NNE. is seen rising to about 1450′, while to the west a very steep ridge of heavy conglomerates, rising to a height of about 1400′, about 900′ above Swamp Creek, forms a narrow divide with a steep slope to the West down to the Mitchell River. About 2½ miles up Swamp Creek its level by aneroid is 500′, and beyond this the country is unfenced and becomes very rough.

The Middle Devonian rocks form a belt, trending about NW. across the area except in the south central part, where they are overlain by the Upper Devonian rocks. They are prominent near Ostler's and Horseshoe Bend, and to the north-west, and have weathered into undulating park-like country, grassed and with few trees.

The Upper Devonian rocks developed in the central part of the area form a rough dissected tableland rising in the central part to nearly 1500′, and owing to a gentle south-west dip of about 5° descending by eroded terrace formations towards the Mitchell River. The Mitchell and Wentworth Rivers and Sandy's Creek all have well developed meanders and horseshoe bends, suggesting that the country had been formerly maturely dissected. Owing to late Tertiary uplifts all the streams were rejuvenated, and have trenched deeply into the underlying rocks. The whole course of Sandy's Creek below the Merrijig junction constitutes now a gorge-like valley, with steep cliffs of Upper Devonian on either side, overlying Ordovician, Silurian and Middle Devonian rocks, all of which slope steeply down to stream level, and in places form precipitous river cliffs. The Mitchell River, about 1½ miles below Ostler's, flows in a picturesque gorge, about 500 feet deep, cut through the Upper Devonian rocks for about a mile or so above the junction with Sandy's Creek. Just south of Camp No. 2, an abandoned course of the Wentworth River is shown by a broken line on the map, trending westerly, and then bending south to join Swamp Creek, just above its junction with the Wentworth River.

Geology.

Upper Ordovician.

Prior to my visits to the district definite Ordovician fossils had been obtained only from one locality (No. 9 on Map) on Sandy's Creek, about 25 chains above the junction with Merrijig Creek. These were obtained by Mr. Herman in 1897, and include *Glossograptus hermani*, *Dicranograptus ramosus* and *Didymograptus ovatus* (7). We revisited the locality and obtained similar specimens of these graptolites. Our examination of the road cuttings east of Camp No. 1, on the road going east towards Bullumwaal, yielded a number of graptolites, including *Diplograptus* sp. and *Glossograptus hermani*, from black cherty slates, interbedded with black cherts about half a mile south-east of Camp

No. 1 (No. 5 on Map). Traces of graptolites were found in similar black cherty slates for about a mile east of this locality. There can be little doubt that all these rocks in the eastern part of the area belong to the Upper Ordovician series, and as such they are shown on the map. The road section east of the Camp shows in addition to black slates and cherts, grey and brown micaceous sandstones and a considerable development of olive-coloured micaceous mudstones, some of which are finely laminated with thin beds of lighter and darker colour suggesting seasonal banding. Several lamprophyre dykes seen in road section 1½ miles east of the camp are described later. One other small inlier of rocks older than the Silurian, and presumably Upper Ordovician in age, although no fossils were found in them, was found in Sandy's Creek. It occurs about 1¼ miles below the junction with the Merrijig Creek, as an elliptical area elongated in a north-westerly direction, and only about 200 yards broad. The rocks are black slates, similar to those containing Upper Ordovician graptolites, and quite unlike the Silurian rocks with which they are in contact. The boundaries of this inlier with the Silurian are probably determined by faults, while the main junction of the Ordovician and Silurian rocks may be determined either by faults or by an unconformity.

Silurian (Yeringian).

It is under this heading that the greatest changes are shown in the map accompanying this paper as compared with previous maps. Hitherto no Silurian rocks have been shown on any map of this area except in Sandy's Creek. As the result of my stratigraphic examination in the field and Mr. Chapman's valuable help in the determination of fossils from a number of localities, it is now known that a broad belt of country in the north-central part of the area and a limited belt in Sandy's Creek below the outcrop of Upper Ordovician rocks consist of Upper Silurian rocks, probably of Yeringian age. The large general geological map of Victoria, 1902, on the scale of 8 miles to the inch, shows as Silurian all the rocks of Sandy's Creek from the junction with the Mitchell River upstream for about 3 miles to just below the Merrijig Creek junction, where the Upper Ordovician rocks come in. Actually the occurrence of Silurian rocks in Sandy's Creek is limited in extent to a strip of country exposed on either side of Sandy's Creek, extending from about 300 yards below the Merrijig-Sandy's junction downstream for about a mile and a half. Even within this belt its continuity is interrupted by the small inlier of Upper Ordovician rocks previously referred to.

Some fossil corals from Sandy's Creek, probably collected by Mr. Herman in 1897, were described by Mr. Etheridge (5) in 1899 as Upper Silurian. The locality was probably from an outcrop of impure limestone about 200 yards upstream from the Upper Ordovician inlier, since we found at that spot similar genera to those described by Mr. Etheridge. The forms he described are

Diphyphyllum porteri var. *mitchellensis,* var. nov., U. Silurian, *Rhizophyllum interpunctatum* De Koninçk, U. Silurian, *Monticulipora* (*Heterotrypa*) *australis,* sp. nov., U. Silurian.

The 1902 map, eight miles to the inch, shows a great area coloured as Middle Devonian limestone, which starts about two miles south of Tabberabbera, and continues northwards for about 18 miles. It is shown extending for two or three miles east of the Wentworth River, and has a maximum breadth of about eight miles, gradually becoming narrower in its northerly extension. The later general geological map of Victoria, 1909, on a scale of 16 miles to the inch, gives this area the colour appropriate to the Upper Devonian sandstones and shales. This is lithologically more correct, but from the point of view of age appears to be further from a correct determination than that shown in the earlier map. My own observations in the field have only extended to a point on Swamp Creek, about three miles north of Tabberabbera, but the rocks up to that point show similar lithological characters to those nearer Tabberabbera, such as localities 1, 2, 3 and 6, on the map, from which abundant fossils, determined by Mr. Chapman as Upper Silurian (Yeringian), have been obtained. It seems certain, therefore, that the southern part of this area up to three miles north of Tabberabbera, consists of Silurian and not of Middle or Upper Devonian rocks, and it is probable that the whole of this area, extending to about 18 miles north of Tabberabbera, consists of rocks of Silurian age.

The localities 1, 2, 3, and 6 from which we obtained abundant fossils occur north and south of the junction of the Mitchell and Wentworth Rivers, which Howitt named as Tabberabbera.

Loc. 1. Allot. 13, S. Websdale, Tyirra.
Fossils—*Bythotrephis* cf. *gracilis* J. Hall.
Spirifer aff. *crispus* (Hisinger).
Yeringian.

Loc. 2. Allot. 14. Tyirra.
Fossils—*Spirifer* aff. *crispus* (Hisinger).
Ctenodonta cf. *portlocki* Chapman.
Yeringian.

Loc. 3. Allot. 9A, E. Desailly, Tyirra.
Fossils—*Spirifer* aff. *crispus* (Hisinger).
Pentamerus aff. *lens* (Sowerby).
? *Glossites* or ? *Palaeoneilo.*
Actinopteria sp.
Yeringian.

Loc. 6. Allot. 6, Nungatta. E. bank of Mitchell River, about half mile south of Birch's.
Fossils—Plant remains, ind.
? *Tryplasma.*
Chollotrypa sp.
cf. *Favosites gothlandica* Lam.
Roemingeria sp.
cf. *Leptaena* sp.
Atrypa aspera (Schloth.). Gerontic forms.
Conchidium sp.
Spirifer sp., probably new.
Yeringian.

This evidence shows that the type locality for the Tabberabbera shales at the junction of the Mitchell and Wentworth Rivers actually consists of Upper Silurian rocks. Dr. Howitt (1, page 206) states: "I found a small limestone patch at Tabberabbera, situated at the junction of the Mitchell and Wentworth Rivers. No fossils have been procured from the limestone, but associated with them are black shales, yielding plentifully the *Spirifera laevicostata* [later redescribed as *Spirifer yassensis*] and a *Grammysia*. They are regarded by Professor McCoy as being of the same age as the Buchan limestones, and therefore Middle Devonian."

To reconcile these statements with the evidence I have obtained, it is necessary to interpret very loosely Howitt's word "associated" in connection with the black shales yielding the above forms. It is almost certain that Howitt did not obtain them from the junction of the Mitchell and Wentworth Rivers, and I was unable to locate such black shales at this junction. It is probable that he obtained them from a locality on the Mitchell River, about three miles below Tabberabbera.

He figures (1, p. 207) a sketch section No. 16 Tabberabbera, showing the fossiliferous black shales on the east side of the Mitchell River, and just below the junction with the Upper Devonian (Iguana Creek) beds. His statement is that the section is "below Tabberabbera." Further on (1, p. 215), when describing his canoe journey down the Mitchell, he states that they started about two miles below Tabberabbera, and after continuing some time he landed and examined a limestone which he states was "very much upon the line of section given in sketch No. 16." It is not possible to locate this place exactly from Howitt's description, but I take it to be about one mile down stream from Ostler's. If that is so, the difficulty disappears, since I have obtained Middle Devonian fossils at Horseshoe Bend and east of Ostler's and rocks of a similar character continue down stream for some distance.

Loc. 4, at the road cutting on the north side of the Wentworth River, about half a mile west of Camp No. 1, provides another fossiliferous locality in the Silurian series. The rocks are finely laminated black and brown cherts crowded with Radiolaria. Mr. Chapman has reported on microscopic sections of these rocks as follows:—

"The rock is crowded with radiolarian remains, but only very few are determinable. In some cases the ferruginous staining and replacement of the siliceous test is an aid to deciphering the form and structure."

Genera or species noted—

Distriactis sp.
Acanthosphaera cf. *etheridgei* Hinde.
Stylosphaera sp.
Spongoloncha cf. *lens* Hinde.

The assemblage closely resembles that from the Tamworth district, described by Hinde in *Quart. Journ. Geol. Soc.*, vol. lv., 1899, pp. 38-64."

Lithological types in the Silurian rocks of this district are numerous and varied. The sections exposed in the road cuttings between localities 4 and 2 on the map, are in a zone of great crushing and contortion. Olive mudstones and dark calcareous shales, some very fossiliferous, are common. In places where the calcium carbonate has been leached out the rocks are rusty brown in colour, and the fossils are only preserved as casts. Thin lenticular blue limestones were also noted. Sandstones and grits are fairly prominent. Calcareous mudstones and thin blue limestones occur also south and north of Loc. 6, South of Birch's. An impure blue limestone in Sandy's Creek about 200 yards above the Upper Ordovician inlier yields an abundant supply of Silurian corals.

Two parallel massive and thick conglomerates with intercalated grits are shown on the map, extending from east of E. Websdale's down to the Mitchell River, and a smaller conglomerate and grit higher in the Silurian series are shown east of Swamp Creek.

The pebbles in the most westerly conglomerate near E. Websdale's are up to a foot in length, and are much dimpled and sheared. Fine-grained laminated pink and white sandstones or quartzites were noted about two miles up Swamp Creek adjoining the big dyke shown on the map, and were seen again on the Mitchell River about one mile west of Sinnott's, and very similar types occur in two places in the Sandy's Creek section, one adjoining the western boundary of the Silurian and the other near the eastern boundary of the same series.

Numerous dykes intersect the Silurian rocks. Many appear to have a similar strike to that of the adjoining sediments, others cut across the strike of the sediments at various angles. They include hornblende porphyrites, some fresh and others calcareous with decomposition, quartz felspar porphyries, black dykes showing quartz, and a tinguaite. Brief petrological descriptions of some of these are included later in the paper.

Middle Devonian.

The rocks to which a Middle Devonian age can be assigned are restricted, as shown on the map, to a belt of country occupying the western part of the area.

The junctions with the Silurian rocks to the east have been definitely located only in two places. One is near Loc. 7, on the Mitchell River, east of the saddle of Horseshoe Bend. The other is in Sandy's Creek, just above Whitbourne's Hut, and just east of a prominent sill or interbedded flow near a crush zone, and just west of prominent laminated pink and white quartzites.

Below this point on Sandy's Creek, down to the junction with the Mitchell River, the whole sequence for about $1\frac{1}{2}$ miles across the strike is in the Middle Devonian sediments, and characteristic

Middle Devonian fossils have been collected from several bands of blue limestone or dark calcareous shales exposed in the river cliffs.

One limestone band a few hundred yards below Whitbourne's flat yielded in microscopic sections, according to Mr. Chapman's determination—

Spirifer yassensis.
? *Coenites* or *Campophyllum?*
Carapaces of Ostracods, chiefly *Primitia.*
Syringopora?
Foraminifera including *Pulvinulina?*
Nubecularia?
Crinoid ossicles.

From Loc. 7, just east of the saddle of Horseshoe Bend, abundant fossils were obtained, chiefly as casts, which Mr. Chapman has determined as under:

From a shale band—

Spirifer yassensis de Kon.
Grammysia sp.

and from a limestone band—

Abundant specimens of *Spirifer yassensis* de Kon.

Similar fossils were also obtained at Loc. 8, south of Horseshoe Bend and east of Ostler's. The lithological types in the Middle Devonian include blue limestones, black, brown and yellow shales or slates, some silicified or flinty shales and siliceous sandstones. The rocks at Horseshoe Bend are intensely crumpled, faulted and in places vertical.

Numerous dykes penetrate these rocks, and are especially noticed in the ridge-like saddle of Horseshoe Bend and south from that locality; some striking E. and W., others conforming more or less to the strike of the sediments either W. or E. of north. They include hornblende and other types of porphyrites; at Loc. 8 a tinguaite strikes E. and W.; at Whitbourne's flat on Sandy's Creek an interbedded igneous rock occurring as a sill or lava flow is a fine-grained porphyrite; and S. of Whitbourne's flat a big black basaltic dyke cuts across the sediments. South of Ostler's, where the Mitchell bends to the west, the slopes below the Upper Devonian series consist of a large area of diorite porphyrite, probably intrusive into the Middle Devonian sediments (see Section C-D).

Upper Devonian.

The rocks of this series, provisionally described as of Upper Devonian age, occur within the central and south-western parts of the area shown on the map. They form a series about 900 ft. in thickness. They rest in turn on the heavily eroded edges of folded rocks of the Upper Ordovician, Upper Silurian and Middle Devonian series, and as they themselves are almost horizontal, their dip being not more than 5° to the SW., their relations with the older rocks, even with the Middle Devonian, constitute a very important and striking angular unconformity.

They have not in this district as yet yielded any recognisable fossils, and the validity of the reference of them to the Upper Devonian depends on questions of geological continuity and of lithological correlations with other areas. The following rough section, supplied to me by Mr. J. Easton, and trending in an approximately easterly direction from the Mitchell River above Horseshoe Bend, and just north of Loc. 7, will serve to illustrate the sequence of the rocks of this series. At the base, about 150′ above the level of the Mitchell River, and resting directly and unconformably on the eroded surface of the folded Middle Devonian mudstones and shales, are about 100 feet of purple grits and mudstones, then a few feet of purple breccia followed by about 60 feet of purple mudstone. About four feet of nodular or spherulitic rhyolite comes next, followed by 90 feet of red and grey mudstone, then 20 feet of breccia and conglomerate, 50 feet of mudstones, 3 feet of rhyolite, 70 feet of conglomerate and breccia, and continuing to the top of the series developed in this district about 500 feet of siliceous and pebbly grey sandstone beds.

The precise sequence of these rocks varies somewhat in different parts of the area shown on the map. In some places the interbedded rhyolites are much thicker, and just east of the diorite porphyrite about a quarter of a mile south of Loc. 8 the sequence appears to start with spherulitic rhyolites.

The reference of these to the Upper Devonian is not quite certain, since, as shown on the map, they have a dip of 30°, and it is just possible that they may unconformably underlie the base of the Upper Devonian, and may be a small area of Lower Devonian igneous rocks. If this were so the diorite porphyrite on which they appear to rest would be older than is shown in the sketch geological section.

On the whole, however, it is thought to be more probable that these spherulitic rhyolites are of Upper Devonian age, and that their relatively high and abnormal dip is due to restricted local movement. This view is strengthened since A. W. Howitt (18) in describing the sequence of Upper Devonian rocks in the Snowy Bluff section, refers to interbedded compact felsites (felstones), having in places a spherulitic structure, the spherules being from one to two inches in diameter.

This description corresponds closely with the nature of the spherulites just east of the diorite porphyrite, and is in accordance with their recurrence higher in the series as noted by Mr. Easton in the section described above.

In most parts of the area, however, purple mudstones form the base of the series. No interbedded basalts (melaphyres of Howitt) have been found "in situ" in these rocks, but they probably occur, since abundant pebbles of this type of rock have been found at the Mitchell River at and near Loc. 7. I have not seen any dykes penetrating these rocks, but Mr. Easton informs me of the interesting fact that he has obtained a lamprophyre and several felspar porphyrite dykes intruded into the Upper Devonian sediments.

The lithological characters of these rocks and their prevalent purple and red colours suggest that the series is a lacustrine one, rapidly accumulated in an arid climate subjected to occasional rain storms.

Tectonic Movements and Structures.

The district has clearly suffered from successive movements of compression in post-Upper Ordovician, post-Upper Silurian, and post-Middle Devonian times, and in the Silurian and Upper Ordovician rocks it is almost impossible to distinguish the effects of the earlier from those of the later movements.

The present relations expressed in dips, strikes, trends of fold axes and trend of boundaries between different formations have developed as the result of the combined effects of all the earlier and later structural movements.

The structural features in the Ordovician rocks are fairly clearly shown in the road section, starting from about half mile from Camp No. 1, and continuing for about $2\frac{1}{2}$ miles in a general easterly direction. The distribution of dips and strikes shown on the map indicates that away from the junction with the Silurian the average strike is about N.20°E. and the average dip about 65°-70°. Near the Silurian junction the strikes are much more disturbed, and trend west of north at varying angles from NNW. to W. It would seem that near the Silurian junction along this road section is a zone of special disturbance, and since it will be seen that the Silurian rocks near this junction also tend to have abnormal strikes it may be that either this junction was determined by post-Silurian fault movements or, if the junction be an unconformity, that the post-Silurian movements were only able to impress themselves on the indurated and compressed Ordovician rocks in the neighbourhood of the junction with the Silurian.

The section in Sandy's Creek above the Merrijig junction shows an abnormal strike of N.70°W. This locality is about half mile from the junction with the Silurian. About a mile below the junction the small, probably faulted, inlier of Ordovician rocks has a strike of N.30°W., and an unusually low dip of 20°. This latter may well be an effect of overfolding.

The general strike of the Ordovician east of north, away from the Silurian contact, is in harmony with the evidence given by Teale (10) from Nowa Nowa, and farther east in Croajingolong. In this part of Victoria the trend of the Palaeozoic rocks and of their junctions, as seen on a general geological map, is east of north, and continues in this direction into New South Wales. But northwards from a line through Mt. Wellington, Waterford to Mt. Baldhead, the trend of the junctions of Upper Palaeozoic and Lower Palaeozoic rocks is about N.40°W., and strikes of this nature are common in the Ordovician rocks north of the line mentioned. Both sets of trend lines must be of post-Palaeozoic development, or at any rate continued till late Palaeozoic times, since the trend of the junction of the Upper Devonian and Upper Ordovician rocks in the northern area conforms to the direction of N.40°W.

The structural features in the Silurian (Yeringian) rocks are comparatively simple in the sections seen in Sandy's Creek. The strikes are all west of north, varying from 20° to about 40° west of north. The lines of junction with Upper Ordovician and with Middle Devonian rocks appear to trend about N.40°W.

Much greater diversity of strikes and complexity of folding occur in the central and northern part of the area in sections seen on the Mitchell and Wentworth Rivers and in Swamp Creek on the bare exposed saddles within this part of the region.

West of a north and south line through Camp No. 2, the strikes are all west of north at angles varying from N.20°W., which is a common strike in the western outcrops, to N.65°W., in several places near Loc. 6. In the road sections east of Camp No. 2, and in one or two localities further north, the strikes are all east of north from 20°-50°, except in one case south-east of Camp No. 1, adjoining the junction with the Upper Ordovician. A dyke and grits strike north and south about one mile north of Camp No. 2. On either side of this there is a tendency to a convergence of strike of the beds to the south, suggesting a syncline pitching north. A prominent grit bed on the Wentworth River just north of Birch's shows an axis of a syncline. However, the prominent conglomerate beds shown on the western part of the map continue with a strike of N.20°W. in a southerly direction at least to the Mitchell River. There may be a strike fault east of these conglomerates, and the big dyke seen along Swamp Creek may have been intruded along such a fault. The average dip of the Silurian rocks is very high. The only one as low as 45° occurs near the Middle Devonian junction north-east of Loc. 7. In many cases the beds are vertical, and perhaps the average dip on either side of the fold axes is 70° to 75°. A puckered anticline and syncline with steep northerly pitch occur at Loc. 7 at the junction with the Middle Devonian rocks. While the high dips and the fold axes are the expression of compressional earth movements, the numerous dykes intersecting the Silurian rocks indicate that tensional cracks either accompanied or succeeded the compressive movements within the same geological period or at later times.

The majority of the dykes in the Silurian, especially the porphyrite dykes, appear to strike nearly or quite parallel to the adjoining sediments, but near Horseshoe Bend two dykes, one of them a tinguaite, cut right across the strike of the sediments in an east-west direction.

The structural features in the Middle Devonian rocks have been noted near Horseshoe Bend, near Localities 7 and 8, and in continuous sections along Sandy's Creek for about 1½ miles across the strike upstream from its junction with the Mitchell River.

In the first locality considerable changes in strike direction are noticeable from N.10°E. to N.20°W., while on the saddle in the neck of Horseshoe Bend a porphyrite dyke strikes east and west and farther south at Loc. 8 a tinguaite dyke strikes in the same direction. The rocks in this locality are very steeply folded and crinkled, with dips of 75° to 80°. At Ostler's and south of the Mitchell River south of Ostler's, there is a large area of intrusive rock, dark green in colour, consisting of diorite porphyrite. Howitt also noted the occurrence of a similar rock further down the Mitchell River in a locality which I have not been able to visit. The boundaries and field relations of this rock were not determined, but it is probable that it represents a hypabyssal intrusion of post-Middle Devonian age.

On Sandy's Creek the strikes of the rocks and the fold axes are uniformly west of north, usually about N.20°W. Several anticlinal and synclinal folds are seen in section in the river cliffs, and usually the dips on either side of the axes are at 45°-50°. Dips up to 80° are, however, recorded, and at one of the anticlinal folds severe local puckering and faulting complicate the relations. At the junction with the Silurian rocks just above Whitbourne's Hut, while the dip is westerly, there is a zone of puckering and overfolding with an intercalated fine-grained sill or lava seen in the cliff section. It is clear from these facts that in this region there is evidence of local severe compressive earth movements later than the Middle Devonian. Teale (10) has noted that at Hickey's Creek on the Macallister River, there occurs a local severe tectonic zone of faulting and synclinal folding, which is of post-Upper Devonian age since rocks of this age are involved.

In the Grampians in Western Victoria the author (11) has given evidence of post-Lower Carboniferous plutonic intrusions. The evidence cited from these localities shows that the long maintained view that notable compressive earth movements with accompanying plutonic intrusions ceased in the Lower Devonian period cannot now be entirely accepted.

In Central Victoria the similarity of composition of dacites and granodiorites suggests that although the granodiorites are instrusive into the dacites, they probably belong to the same period of igneous activity, which has been regarded as probably Lower Devonian, since in various places the dacite series is overlain unconformably by Upper Devonian sediments. At Bindi, the Middle Devonian limestones and shales rest possibly unconformably on the Snowy River porphyrites of Lower Devonian age, and are only gently folded. At Buchan, pyroclastic igneous rocks associated with the Snowy River porphyrites, are intercalated with the lower part of the limestones and shales. In the Buchan district the structural relations of the limestone series are seen from numerous recent road sections to have been affected in general by only gentle post-Middle Devonian compressive movements since the average dips seldom exceed 20° except in one or two places, where quite local puckers have developed small anticlinal folds with high dips. At Buchan and Bindi, therefore, the gentle folding stands in marked contrast to the more severe compression which has affected the Silurian rocks generally in Victoria and the Middle Devonian rocks of Tabberabbera.

The rocks described as Upper Devonian in this district have not suffered from any compressive earth movements. They appear in the sections exposed in the field to be almost horizontal, but a dip of about 5° to the south-west can be inferred from the fact that rhyolites and other associated rocks outcropping at river level along the Mitchell at about 400′ elevation are over 1000′ above sea-level about two miles ENE. from that locality.

Significance of the Unconformity between the Middle and Upper Devonian Rocks.

The most remarkable structural features of the district are firstly, the severe compression and folding which have affected the Middle Devonian rocks, whose age is definitely determined by their fossil content, and secondly, the profound character of the unconformity which separates these folded rocks from the flat-lying sediments and lavas which rest on their denuded edges and also unconformably overlie the Silurian and Upper Ordovician rocks. These overlying rocks are here described as Upper Devonian, but the question of their age invites some discussion. As stated above, no fossils have as yet been found in these rocks, but they appear to be geologically continuous, as stated by R. A. F. Murray (17), with the series developed further south at Iguana Creek, and south-west at the Avon River. There is continuity and similarity of sedimentation in all three areas, but McCoy (11) described the Avon River beds as Lower Carboniferous, on account of the presence in them of *Lepidodendron australe,* and the Iguana Creek Beds (12) as Upper Devonian on account of the presence in them of *Cordaites australis* and *Archaeopteris Howitti.*

A broad belt of similar sediments stretches N.40°W. from the Avon River through the Mt. Wellington district, described by Teale (10), to Mansfield. Near Mansfield, on the Broken River, Cresswell and, later, George Sweet (14) discovered plants and fossil fish partially described by McCoy (13) as showing forms of mingled affinities ranging through Lower Devonian, Upper Devonian to the base of the Carboniferous. McCoy placed the Mansfield Beds as at the top of the Upper Devonian. It should be noted that McCoy identified the plant remains as *Lepidodendron Mansfieldense,* a species quite distinct from the form met with in the Avon River section. Smith Woodward (15), however, later described the Mansfield fossil fish as typically Lower Carboniferous, and the Geological Survey of Victoria, in their latest general geological map of the State (1909), on the scale of 16 miles to the inch, have distinguished the beds round Mansfield from the rest of the belt of similar rocks, colouring them as Carboniferous, and the rest, including the Avon River beds, as Devonian. In numerous localities in New South Wales, as at Mt. Lambie and Tamworth, New South Wales geologists have shown that, in that State, *Lepidodendron australe* is interbedded with marine beds containing Devonian marine fossils, at Tamworth with radiolarian cherts described as of Middle Devonian age, and at Mt. Lambie and elsewhere interbedded with marine beds containing *Spirifer disjuncta*, a typical Upper Devonian brachiopod. Professor Benson (16) has given a full discussion on the Devonian palaeontology of Australia and discussed the stratigraphical implications.

Our Victorian problem is to reconcile the geographical continuity over a wide area of fairly flat-lying beds of similar lithological types, and apparently one series formed under similar conditions, with the palaeontological determinations which would place the Avon River Beds on plant determinations as Lower Carboniferous, the Mansfield beds as Lower Carboniferous on identification of fossil fish, and the Iguana Creek beds as Upper Devonian on the identification of fossil plants.

The reconciliation of these apparent anomalies will probably not be achieved until continuous and detailed geological surveys are made throughout the broad belt of rough mountainous country between Iguana Creek and the Avon River, and between the Avon River and Mansfield. Until this work has been accomplished the point of view expressed on the Geological Map of Victoria in 1909—the separation of the Mansfield area from the remainder—appears to have some justification.

The important evidence from various localities in New South Wales that *Lepidodendron australe* is there an Upper Devonian form may justify us in Victoria in regarding the Avon River beds as well as the Iguana Creek beds as of Upper Devonian age.

In this connection it is perhaps pertinent that the broad belt shown on the Geological Survey Map of Victoria, 1909, as Devonian, is an area throughout which there are intercalated with the conglomerates, sandstone and shales, important flows of rhyolite and thinner sheets of basic lavas (melaphyres of Howitt) and similar intercalated igneous rocks are recorded from several of the New South Wales areas in which Upper Devonian rocks are recorded. But in the Mansfield area these intercalated igneous rocks have not been found. Despite then the similarity of the sediments in the Mansfield district to the sediments farther to the south-east, the absence of contemporaneous lavas in the Mansfield area, may be regarded as negative evidence supporting the positive evidence of the fossil fish described by Smith Woodward as fixing a Lower Carboniferous age for the Mansfield beds.

The foregoing discussion then may justify us in accepting, at any rate provisionally, the flat-lying sediments with intercalated lavas of the Tabberabbera district as of Upper Devonian age.

If this view is correct the significance of the gigantic unconformity between these beds and the highly crumpled Middle

Devonian rocks beneath is remarkable and difficult to explain, for we have to picture that in this part of Victoria in the geologically short interval between Middle and Upper Devonian the sea receded, the Middle Devonian rocks were crumpled and elevated, and denuded to a low-lying area, before the lacustrine conditions of the Upper Devonian were established.

Petrographic Characters of the Igneous Rocks of the District.

In this paper, mainly concerned with structural and stratigraphical relations, only brief descriptions of the igneous rocks will be given. The reference numbers are those of the main collection of rock sections in the Geological Department of the University of Melbourne.

Dykes of varying size and petrologic character occur in the Upper Ordovician, Silurian (Yeringian), Middle Devonian and Upper Devonian (Easton's communication) rocks.

A big hypabyssal or small plutonic intrusion of diorite porphyrite occurs in the Middle Devonian rocks as well as an intercalated sill or lava flow.

Prominent nodular or spherulitic rhyolites, as well as banded flow rhyolites, occur in the Upper Devonian, and the evidence of boulders in the river-beds suggests that basic flows (melaphyres) may also be represented in the Upper Devonian, although they have not yet been found "in situ."

In the Upper Ordovician sediments, apart from spherulitic keratophyres, and a hornblende porphyrite, high up Sandy's Creek, near the Bullumwaal road, the only dykes found up to the present are somewhat decomposed mica lamprophyres. A boulder of a somewhat similar rock found about two miles up Swamp Creek suggests that mica lamprophyres may also penetrate the Silurian rocks, while a boulder of a fresh green tinguaite, No. 1726, found about three miles up Sandy's Creek, indicates that a dyke of this type probably intruded the Ordovician sediments. Within the Silurian (Yeringian) rocks, dykes of hornblende porphyrite, felspar porphyrite, quartz felspar porphyrite, oligoclase trachyte and of tinguaite, No. 1737, have been found, and a boulder of fresh tinguaite, No. 1718, was found in the Mitchell River, about half a mile below E. Websdale's house. This represents material from a dyke which may intersect either Silurian or Upper Ordovician rocks, since the Mitchell River above this point drains areas of both these series. Dykes penetrating the Middle Devonian sediments include numerous porphyrites, a basalt and a tinguaite, No. 1727. It will be noted that four felspathoid-bearing rocks are now known from this district. The author (8) has given petrographic descriptions of them recently, so that it is not necessary to refer to them further, except to point out that within recent years it has become known, by the author's contributions to recent volumes, as one of the Secretaries to the Alkaline Rocks Research Committee of the Australasian Association for the Advancement of Science, that Eastern Victoria must be regarded as an alkali-rich province. Phonolites and tinguaites have been recorded by him from the Tolmie Ranges, near Mansfield, from Pretty Boy pinch, west of Tabberabbera, from near Mt. St. Bernard, north-north-west of Tabberabbera, and from near Omeo, north of Tabberabbera. Many of these are so fresh and unaltered that they may quite likely be of Middle to Late Kainozoic age, like the alkali rocks of Mt. Macedon and the Western District of Victoria. If this is so, they may have been intruded along tension cracks associated with the successive plateau elevating movements, differential in character, which have uplifted Eastern Australia. It cannot, however, be said that their association with fault movements has yet been proved or definitely established.

Descriptions of Rock Sections of Igneous Rocks.

1608. Dyke 10′ thick, road cutting in Upper Ordovician, 1½ miles east of Camp No. 1.

A dense dark fine-grained rock in hand specimen, weathering to a rusty brown colour. Pale to pink "Schlieren" occur through it and occasional large plates of biotite are present. Under the microscope brown biotite is abundant, green and brown sub-porphyritic hornblendes, and small prismatic green to brown crystals of the same mineral are abundant. Large clear zoned crystals of plagioclase are invaded by the ferromagnesian minerals and the ground mass is partly cloudy through the alteration of the smaller felspars, while "Schlieren" are represented by clear colourless areas, partly consisting of felspar, and isotropic areas which occur suggest that a felspathoid such as sodalite may be present. The rock may be described as a mica hornblende lamprophyre.

1723. Dyke through Upper Ordovician in the upper part of Sandy's Creek, near the Bullumwaal road.

In hand specimen the rock is rather decomposed, cream-coloured, and apparently largely felspathic. Under the microscope it is seen to be practically wanting in ferromagnesian minerals, and to be composed almost entirely of felspar. A few areas of almost colourless chlorite indicate the former presence of a small amount of a ferromagnesian mineral. A number of small quadrate to lath-shaped clear felspars with fine twin lamellae and almost straight extinction consist of oligoclase, while the bulk of the rock consists of spherulitic aggregates of felspar laths. The rock may be described as a spherulitic keratophyre.

1738. Dyke penetrating Upper Ordovician high up Sandy's Creek near Bullumwaal road.

In hand specimen the rock appears to be fairly fresh, dark grey in colour, fine grained with small porphyritic crystals. Under the microscope the rock consists mainly of two minerals. Plagioclase is abundant as fair sized porphyritic fresh crystals of quadrate habit and moderate extinction angle indicating andesine. Somewhat later than the felspar is abundant pale hornblende, some of which is altered to chlorite. A little magnetite in crystals and irregular grains is also present. The rock is a rather basic hornblende porphyrite.

1730. Dyke cutting Upper Ordovician high up Sandy's Creek, about one mile below Bullumwaal road.

In hand specimen the rock is cream coloured, with porphyritic quartz. Under the microscope large corroded crystals of quartz showing crystal boundaries are common, and large abundant phenocrysts of plagioclase ranging from oligoclase to andesine are set in a fine groundmass of spherulitic aggregates of felspar. Small microscopic quartz veins penetrate the rock. The rock may be described as a porphyritic and microspherulitic quartz keratophyre.

1724. Weathered dyke cutting Silurian, 250 yards NE. of Loc. 2.

The hand specimen is a dense fine-grained brownish grey rock, with porphyritic felspars. In section its altered character is apparent. All the larger felspar phenocrysts are kaolinized. Smaller quadrate phenocrysts are oligoclase, as is most of the felspar in the felted groundmass. The ferromagnesian mineral has altered to chlorite and a small amount of secondary calcite is present. The rock may be described as an oligoclase trachyte.

1747. From big dyke cutting Silurian shown on map along Swamp Creek, from quarter mile below top fence.

In hand specimen the rock has a rather coarser texture than most of the dykes seen, and shows small phenocrysts of felspar and hornblende. Under the microscope both plagioclase and hornblende are abundant, each is in turn porphyritic, and each may be included in the other, suggesting almost simultaneous crystallization. The groundmass consists mainly of small plagioclase felspars. The felspar is mainly oligoclase, the hornblende is pale, and some amount of minute magnetite is present, and secondary calcite occurs in small amount. The rock is a hornblende porphyrite.

1743. From same dyke as 1747, but 10 chains lower down Swamp Creek.

In hand specimen its paler colour and more altered appearance than 1747 is noted. Under the microscope it is distinguished from 1747 by the absence of hornblende, and the abundance of secondary calcite and the presence of a fair amount of quartz in the groundmass. The rock is an altered felspar quartz porphyrite.

1606. Dyke penetrating Silurian, road east of Loc. 2, at northwest corner of Allot. 9, R. J. Oates.

In hand specimen the rock is dense, cream-coloured, with porphyritic quartz crystals. Under the microscope large phenocrysts of oligoclase, andesine and of corroded quartz crystals are set in a micrographic groundmass of quartz and acid plagioclase. The rock is a micrographic quartz felspar porphyrite.

1719. Dyke cutting Silurian and striking north and south from hill east of Swamp Creek. Allot. 2, K. Sinnott.

In hand specimen the rock is dense and cream-coloured, with porphyritic felspars and quartz. Under the microscope phenocrysts of untwinned felspar and of corroded quartz are set in a microcrystalline groundmass of quartz and felspar, consisting of both plagioclase and orthoclase. Some elongated biotite more or less altered to chlorite is also present. The rock is a quartz felspar porphyry.

1744. Big dyke 110′ thick, penetrating Silurian near western boundary, 250 yards above Whitbourne's Hut, Sandy's Creek.

In hand specimen the rock is dense and dark greenish in colour, with small felspar phenocrysts. Under the microscope the rock is seen to be considerably altered. The plagioclase phenocrysts are decomposed, and the hornblende replaced by chlorite and abundant calcite. The groundmass contains small crystals of magnetite, but consists mainly of a microcrystalline aggregate of felspar, with some quartz. The rock is an altered hornblende porphyrite.

1739. Black dyke cutting Silurian conglomerate on Mitchell River, west of Sinnott's.

In hand specimen the rock is black and densely crystalline. Under the microscope it is seen to be fresh with ophitic texture since lath-shaped labradorite penetrates pale brown augite, a little of which is altered to chlorite. Irregular crystals of magnetite are fairly abundant. The rock is a dolerite.

1733. Big dark dyke cutting Silurian quartzites, and striking N.10°W. near bend in Mitchell River, west of Sinnott's.

In hand specimen the rock is a black fine-grained but crystalline rock with felspar phenocrysts. Under the microscope it is seen that the rock has suffered dynamic alteration. Porphyritic plagioclase felspars are set in a finer ophitic intergrowth of felspar laths and ferromagnesian minerals, but the latter are now fibrous hornblende and the plagioclase has been mostly recrystallized to radiating or needle-shaped secondary minerals. Fine-grained irregular crystals of magnetite occur in the groundmass. The rock is a fine-grained dynamically altered dolerite.

1746. Dark dyke striking east and west, eight chains NW. of saddle of Horseshoe Bend.

In hand specimen the rock is a dark grey fine-grained crystalline rock. Under the microscope the rock is seen to consist of large lath-shaped labradorite, with prismatic to irregular pale purplish to brown augite and a fair quantity of magnetite or ilmenite. Considerable alteration of much of the augite has occurred with the development of calcite and the introduction of some chlorite. In the interstices of the rock some of the felspar is somewhat spherulitic. The rock is a fine-grained felspathic dolerite.

1729. A rather large mass probably intrusive into the Middle Devonian, south of Ostler's, on the Mitchell River.

In hand specimen the rock is of medium grain size, and dark grey green in colour. Under the microscope the texture is between the hypabyssal and the plutonic. There is a tendency for the irregularly quadrate felspars, oligoclase to andesine, to be porphyritic. The ferromagnesian mineral, originally hornblende, is now largely pale green and fibrous in habit, and is largely chlorite. A small amount of minute felspars with interstitial quartz, constitutes a second generation of crystals in which are recognised small magnetite phenocrysts and occasional irregular crystals of sphene. The rock is a diorite porphyrite.

1731. Big dyke 150′ thick, striking N.40°E., penetrating Middle Devonian, west of Loc. 7.

In hand specimen the rock is a nearly black, fine-grained rock, showing minute quartz and specks of pyrites. Under the microscope its fine-grained texture is clear, but the rock is much altered, both plagioclase and augite being largely altered. The lath-shaped plagioclase still shows twinning, but the ferromagnesian mineral is now changed to chlorite. A little interstitial quartz, and a small amount of black opaque iron ores occur; calcite is moderately abundant. The rock is a fine-grained quartz dolerite.

1732. Dyke 15′ thick, cutting Middle Devonian, south end of Whitbourne's paddock, Sandy's Creek.

In hand specimen the rock is black, fine-grained, but crystalline, with small porphyritic felspars. Under the microscope the rock is clearly porphyritic. Clear large lath-shaped labradorite felspar and pale brown augite phenocrysts are set in a finer textured ophitic aggregate of the same minerals, with the addition of granular magnetite; green chlorite and calcite, are noted as secondary products. The rock is a porphyritic dolerite.

1612. Sill or interbedded flow in Middle Devonian five chains south of south end of Whitbourne's flat, Sandy's Creek.

In hand specimen the rock is dark, fine-grained, and somewhat decomposed. Under the microscope it is seen to be considerably altered. Phenocrysts of altered plagioclase and hornblende altered to chlorite are abundant. A fair amount of granular magnetite is present and the felspathic groundmass contains a little interstitial quartz. The rock is an altered porphyrite.

1745. Acid lava at base of Upper Devonian, ridge south of Ostler's, and south of the Mitchell River.

In hand specimen the rock is compact, fine-grained, pink to grey coloured, showing fluidal banding. Under the microscope the fluxion structure is well developed. Phenocrysts of corroded quartz crystals are set in a microcrystalline to cryptocrystalline groundmass of quartz and felspar in which dark irregular bands are developed streaming past and round the phenocrysts. The rock is a banded and fluidal rhyolite.

1740. A nodular or spherulitic lava at the base of the Upper Devonian, ridge south of Ostler's, and south of the Mitchell River.

In hand specimen large nodular spherulites up to $1\frac{1}{2}$ inches diameter of dense brown material, with lighter margin, are set in a dense fine-grained matrix. Under the microscope the section passes through the margin of one of the nodules, which is brown in colour and almost completely glassy. The nodules are set in a rock which shows a remarkable flow structure of cryptocrystalline to glassy texture, in which occur small phenocrysts of corroded quartz and of felspar. The rock is a spherulitic or nodular rhyolite.

Summary and Conclusions.

The earlier work of Howitt and others in the Tabberabbera district is referred to. The conditions of access to the district have been improved by the making of good roads to the area, but within the area the diminution of settlement due to decay of mining and introduction of rabbits has led to the overgrowing of tracks, the growth of secondary scrub and the blackberry pest; and these combine with the rugged topography to make geological work difficult. Two periods of three weeks each in January and February of 1924 and 1925 were spent in the area, which lies 40 miles NNW. of Bairnsdale in Eastern Victoria. The boundaries of the geological formations are approximately located on the map published with this paper, and the structure elucidated by three sketch geological sections. The area of Upper Ordovician rocks, consisting of black shales, cherts and sandstone, previously known in Sandy's Creek has been extended.

It has been shown that at Tabberabbera itself, formerly regarded as the type area for the Tabberabbera shales of Middle Devonian age, no Middle Devonian rocks occur, but that a broad belt of Silurian rocks, consisting of impure limestones, shales, grits, sandstones and conglomerates, trends NNW. to SSE. across the area, including Tabberabbera. The Middle Devonian rocks, consisting of blue limestones, shales and sandstones, with characteristic fossils such as *Spirifer yassensis*, are restricted to the western part of the area.

The Upper Devonian rocks, red and purple sandstones, shales and conglomerates, with interbedded rhyolites, form an unconformable plaster in the central part of the area, resting in turn on the denuded edges of Middle Devonian, Silurian and Upper Ordovician rocks. The Ordovician, Silurian and Middle Devonian rocks have suffered from very severe compressive earth movements, and are in consequence highly folded, even the Middle Devonian showing dips ranging from 45° to 80° on either side of the fold axes. The boundaries between these formations are determined by unconformities or faults. The Upper Devonian rocks, with a dip of 5° to the SW., have not been compressed into folds, but were elevated and tilted with the older rocks by late Kainozoic differential earth movements. The Mitchell and Wentworth Rivers have cut steep valleys and gorges, and have given an immature topography to the district.

The outstanding structural features in the Tabberabbera district are the local character of the severe compression of the Middle Devonian sediments, contrasted with their open folding at Buchan and Bindi, and the gigantic character of the unconformity separating them from the Upper Devonian rocks. The appreciation of this has led to the discussion of the age of the rocks called Upper Devonian, from which no fossils have been obtained in this district. The comparison with areas of similar rocks at Iguana Creek, the Avon River, Mt. Wellington and Mansfield in Victoria, and Mt. Lambie and other areas in New South Wales, has led to the view that the reference of them to the Upper Devonian can be justified on the available evidence.

A brief account of the petrology of the igneous rocks of the area is appended. Lava flows of spherulitic and of banded rhyolite are interbedded with the Upper Devonian. It is shown that numerous dykes penetrate the Ordovician, Silurian and Middle Devonian rocks, and that a few have been noted by Mr. Easton penetrating the Upper Devonian. The types include mica lamprophyres, hornblende porphyrites, felspar porphyrites, keratophyres, quartz keratophyres, spherulitic quartz porphyrites, dolerites and oligoclase trachytes. In addition four examples of felspathoid-bearing rocks, tinguaites, have been recorded, two as boulders and two as dykes "*in situ.*"

It is shown that the Eastern part of Victoria constitutes an alkali-rich province, since felspathoid-bearing rocks have been previously recorded by the author from Pretty Boy Pinch, the Tolmie Ranges, Mt. St. Bernard and from Omeo, localities lying west, north-west, north and north-east of Tabberabbera.

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